A. I. A. File Number 25a23 or 25c3

Standard Specification

for the use of

Red-Lead Paint

National Lead Company

A. I. A. File Number 25a23 or 25c3

79-26

STANDARD SPECIFICATION

for the use of

RED-LEAD PAINT

NATIONAL LEAD COMPANY

NEW YORK
111 Broadway

BOSTON
131 State Street

CHICAGO
900 West 18th Street

SAN FRANCISCO
485 California Street

BUFFALO
116 Oak Street

CINCINNATI
659 Freeman Avenue

CLEVELAND
820 West Superior Avenue

ST. LOUIS
722 Chestnut Street

PHILADELPHIA
John T. Lewis & Bros. Co.
437 Chestnut Street

PITTSBURGH
National Lead & Oil Co. of Pa.
316 Fourth Avenue

INSTRUCTIONS

Unusual care has been taken in preparing these specifications to make them complete, absolutely reliable and in the most complete form possible.

The specifications are based on approved modern painting practice, and are authoritative in every detail. If followed implicitly by the painting contractor, therefore, a satisfactory job is assured.

It will be necessary, of course, in specifications to the painting contractor to include only those paragraphs of our specifications that cover the specific work to be done. For the user's convenience we have employed letters and numerals to designate the sections, their main divisions and the paragraphs of the latter.

If desired, detail of work to be done as outlined in Section C is the only part which need be written out in full. The details of materials and workmanship may then be covered by the following clause:

> *All painting work under this contract, except as hereinafter specified, shall be executed in strict conformity with the Standard Specification of National Lead Company, which Standard Specification is hereby declared and made part of this specification, with the same force and effect as if written herein in full.*

The specifications are printed on the right hand pages. On the left hand pages appear notes that refer to the correspondingly numbered paragraphs on the specification pages opposite. The notes in some instances give information about the products and formulas mentioned in the specifications; in other instances they explain and give reasons why certain recommendations are made in the paragraphs to which they refer.

The user will find space in these "note pages" to enter any notes or observations that he may wish to make for his own guidance or information.

INDEX

1. The following materials are covered in these specifications: Red-lead, raw linseed oil, boiled linseed oil, turpentine, driers and putty.

STANDARD SPECIFICATION

FOR THE

USE OF RED-LEAD PAINT

SECTION A

Preparation and General Requirements

1. MATERIALS:

All materials used for the work shall be as described under "Section B" of the "Standard Specification for the use of Red-Lead Paint."

2. DRAWINGS:

The painting contractor shall be furnished with all drawings, details and other information necessary for the painting of all classes of work which are to receive a painted finish.

3. GENERAL CONDITIONS:

The General Conditions of the American Institute of Architects, latest edition, shall form a part of this specification and contract, and all work shall be subject to the provisions thereof, insofar as they apply to work under this specification.

4. WORK INCLUDED:

(a) The painting contractor shall provide all labor, material, tools, staging and equipment necessary. The work shall include all painting of exposed metal surfaces, such as tin, galvanized iron, iron and steel, cast iron or iron and steel used in roofing, cornices, valleys, gutters, down spouts, railings, gratings, fire-escapes, steel or wrought iron steps and other exposed metal work, both exterior and interior, except copper or bronze.

(b) (Here describe generally the character of the work which is to be painted.)

(c) (Here also describe the work which will be delivered primed under other specifications, but shall be finished under this specification.)

5. ALTERATIONS AND REMODELING:

All present work that is removed and reset, or that is affected in any way by the alterations and remodeling, shall be refinished to match the finished surfaces adjacent thereto.

6. STORAGE:

The painting contractor shall store his materials in one place in the building, and such storage place shall be kept neat and clean and all damage thereto or its surroundings shall be made good; care being taken in the storage of paint, oils, etc., to prevent all danger of fire. Oily rags shall be removed from the building every day upon the stopping of work.

7. (f) Wherever possible, round or oval brushes known as pound brushes, should be used.

9. Where white or an exceptionally light tint is specified, two coats of white-lead paint should be used on interior work in order to cover the red-lead under-coat. In such a case specify formulas H and J, adding about one ounce of lampblack to formula H. This should also be added for the second coat on exterior work where the finishing coat is to be white or extremely light.

10. Washing glass is not intended to be included in this specification. If the architect wishes it to be included, he should specifically mention it.

7. WORKMANSHIP:

(a) All surfaces to which paint is to be applied shall be dry and clean. No painting shall be done outside in extremely cold, frosty, foggy or damp weather. Painting done in winter weather shall be done only when the temperature is above 50°F. and all surfaces are absolutely dry.

(b) All surfaces before priming shall be cleaned thoroly of all dirt, oil, grease, rust, scale and other foreign matter. This cleaning shall be done with steel scrapers and with wire brushes where necessary.

(c) Where old work is to be repainted, loose scales, rust and other foreign substances shall be removed from the surfaces by scraping and by cleaning with wire brushes, also hammering the material where necessary or by the use of a sandblast where this may be required.

(d) No coats of paint shall be applied on wet or damp surfaces and in no case until preceding coat is dry and hard.

(e) Exterior work shall be allowed to dry from two to four days before the next coat is applied, and for interior work at least twenty-four hours for each coat and at least a week for priming coat.

(f) All paint shall be evenly spread and shall be thoroly brushed out.

(g) All metallic surfaces where solder fluids have been used, shall be thoroly cleaned with benzole before any paint is applied.

(h) In painting structural steel or other metal work, all bolt and rivet heads, shall be carefully covered with paint, also all edges and corners.

8. SAMPLES:

(a) Samples of all finishes shall be submitted to the architect or engineer for approval before applying; and finished work shall match same.

(b) Where formulas are altered to any great extent to secure intermediate shades of green or brown the amount of linseed oil used shall be increased or decreased accordingly.

9. LIGHT FINISHES:

In places where light finishes are specified Dutch Boy white-lead and linseed oil, properly tinted, shall be used for the last two coats.

10. CLEANING:

Upon completion of the building, the painting contractor shall see that all paint spots are removed from all finished work; and shall leave the entire building free from rubbish caused by his work; and shall remove his equipment from the premises. He shall present the work clean and free from blemish.

11. The following materials are covered in these specifications: Red-lead, raw linseed oil, boiled linseed oil, turpentine, driers and putty.

11. (b) A. S. T. M. specifications for red-lead will be found on page 10.

11. (c) A. S. T. M. specifications for raw linseed oil will be found on pages 12 and 13. Specifications are given for oil made from both South American and North American seed, because the specifications differ slightly and both sources are important in furnishing the supply. Oil conforming to either specification should be considered satisfactory.

11. (d) A. S. T. M. specifications for boiled linseed oil will be found on pages 19 and 20. Specifications are given for oil made from both South American and North American seed, because the specifications differ slightly and both sources are important in furnishing the supply. Oil conforming to either specification should be considered satisfactory.

11. (e) A. S. T. M. specifications for turpentine will be found on page 15.

11. (f) Government specifications for liquid paint drier will be found on page 16. Driers are agents, usually liquids, added to paint to hasten the oxidation and the hardening of the film. Red-lead and raw linseed oil will dry without artificial aid in about three days, but the prevalence of dust and insects makes it generally desirable for paint to harden in eight to ten hours. A drier is therefore necessary. It is not harmful if good and not used in excess of one quart to four gallons of oil. If too much is used, the paint dries on the surface and leaves the under part soft. Also crumpling of the surface of the paint is likely to follow. If boiled oil is used, no additional drier is necessary; see 14, page 4 of Notes.

SECTION B

Materials and Mixing

11. MATERIALS:

(a) All materials for painting shall be delivered at the building in unbroken packages, bearing the brand and manufacturer's name, and shall be used without any adulteration.

(b) *Red-Lead:*

All red-lead shall be pure Dutch Boy red-lead-in-oil or may be dry red-lead, conforming to the specifications of the American Society for Testing Materials.

(c) *Raw Linseed Oil:*

All raw linseed oil shall be pure settled oil, Dutch Boy brand or its equal, and shall agree with the specifications of the American Society for Testing Materials.

(d) *Boiled Linseed Oil:*

Where boiled linseed oil is to be used in paint, it shall be pure boiled linseed oil, Dutch Boy brand or its equal, and shall conform to the specifications of the American Society for Testing Materials.

(e) *Turpentine:*

All turpentine shall be of the best grade of pure spirits of turpentine, conforming to the specifications of the American Society for Testing Materials.

(f) *Driers:*

All driers used shall be the product of an approved manufacturer and shall conform to "Standard Specification No. 20" of the United States Government.

11. (g) Good putty is necessary to give satisfactory results. Specifications are given to avoid use of putty containing improper materials. So often inferior putty is found on the market. If the architect desires, the best grade of linseed oil and whiting putty may be used for glazing.

12. (a) It is important to use colors-in-oil in tinting. It is practically impossible to incorporate dry tinting colors. High grade tinting colors are important. The use of poor tinting materials is indicated when it is found that a much larger quantity than specified in our formulas is needed to match the desired tint. The use of such excessive quantities introduces adulteration into the paint.

12. (b) The directions for colors referred to are the specifications which must be written especially for each job and places for which are provided in Section C.

13. In order to thoroly incorporate the ingredients, especially to avoid streaking of tinting materials, the following order of mixing is recommended:

First—place the proper amount of red-lead required by the formula in a large pail and break it up with just enough oil to bring it to a workable paste, using a wooden paddle to stir. *Second*—add colors for tinting if the paint is to be tinted, mixing them thoroly into the red-lead. *Third*—add the drier and stir thoroly. *Fourth*—add the remainder of the oil required by the formula, stirring thoroly. *Fifth*—put in the turpentine and stir the whole mass until thoroly mixed. *Sixth*—strain the paint thru a cheese cloth or fine wire mesh strainer.

14. In all formulas marked with an asterisk* the use of one-third boiled oil and two-thirds raw oil is recommended if genuine boiled oil is available. In that case no drier is needed. If raw oil only is used one-half pint of drier should be added to every gallon of paint.

11. MATERIALS—*Continued:*

(g) *Putty:*

Putty shall be composed of pure white-lead and whiting, mixed with pure linseed oil to putty consistency, and shall contain from 10 to 50 per cent white-lead, depending on the purpose for which the putty is to be used. For puttying up nail holes and other defects the white-lead content shall be 50 per cent. For metal sashes the pigment content may include 10 per cent of powdered litharge.

12. TINTING:

(a) When the paint is to be tinted, pure colors-in-oil, ground in pure linseed oil and of the highest grade obtainable, shall be used.

(b) The various colors, tints, or shades desired shall be in accordance with special directions given hereinafter.

13. MIXING:

All red-lead paint shall be mixed at the job in a manner to assure the proper incorporation of the ingredients, and in conformity with formulas hereinafter given.

14. FORMULAS:

(a) The following formulas are divided into different classes for the painting of exterior and interior metal work of various kinds.

(b) The painter shall use his own discretion in adding pure turpentine for the purpose of making the paint produced by the specified formulas work more easily. The proportion, however, shall not exceed one gill of pure turpentine to one gallon of paint.

14. (c) Formula A Dutch Boy red-lead formula, makes 4⅝ gallons of paint, which should cover about 2,775 square feet, one coat. Dry red-lead formula makes 5 gallons of paint, which should cover about 3,000 square feet, one coat.

14. (c) Formula B may be omitted on all interior unexposed work. It is recommended, however, that it be specified on interior surfaces which are to receive hard service.

14. (c) Formula B Dutch Boy red-lead formula, makes 4¾ gallons of paint, which should cover about 2,850 square feet, one coat. Dry red-lead formula makes 5¼ gallons of paint, which should cover about 3,150 square feet, one coat.

14. (c) Formula C Dutch Boy red lead formula, makes 6½ gallons of paint, which should cover about 3,900 square feet, one coat. Dry red-lead formula makes 6¾ gallons of paint, which should cover about 4,050 square feet, one coat.

14. (c) Formula D makes 12 gallons of paint, which should cover about 7,200 square feet, one coat.

14. (c) *Steel & Iron (Exterior and Interior):*

FORMULA A

Priming Coat

*100 pounds Dutch Boy red-lead.
2½ gallons pure linseed oil.

or

*100 pounds pure dry red-lead.
3⅝ gallons pure linseed oil.

FORMULA B

Second Coat

(*LIGHT BROWN*)

*100 pounds Dutch Boy red-lead.
2⅝ gallons pure linseed oil.
12 ounces paste lampblack.

or

*100 pounds pure dry red-lead.
3¾ gallons pure linseed oil.
13 ounces paste lampblack.

FORMULA C

Finishing Coat

(*DARK BROWN*)

*100 pounds Dutch Boy red-lead.
3⅝ gallons pure linseed oil.
6 pounds paste lampblack.

or

*100 pounds pure dry red-lead.
4¾ gallons pure linseed oil.
6½ pounds paste lampblack.

FORMULA D

Finishing Coat

(*LIGHT GREEN*)

*100 pounds Dutch Boy red-lead.
7½ gallons pure linseed oil.
31 pounds paste medium chrome yellow.
24 pounds paste prussian blue.

*See 14, page 4 of Notes.

14. (c) Formula E makes 18 gallons of paint, which should cover about 10,800 square feet, one coat.

14. (c) Formula F makes 25 gallons of paint, which should cover about 15,000 square feet, one coat.

14. (c) Formula G should be specified as the final coat, when an attractive, light gray finish is desired. It will hide the red-lead undercoatings with a single coat.

14. (c) Formula G. Some painters consider paste dropblack with a little paste prussian blue superior to the lampblack and french ochre in this formula. If dropblack is used, more of the color will be required, because it is not as strong as lampblack.

14. (c) Formula G makes 6¾ gallons of paint, which should cover about 4,050 square feet, one coat.

14. (c) Formula H suitably tinted should be specified as the second coat, when light tints are desired, (replacing formula B), and formula J as the finishing coat.

14. (c) Formula H makes 6 gallons of paint, which should cover about 3,600 square feet, one coat.

14. (c) Formula J may be tinted to any desired light color.

14. (c) Formula J makes 6½ to 7 gallons of paint, which should cover about 3,900 to 4,200 square feet, one coat.

14. (c) *Steel & Iron* (*Exterior and Interior*)—Continued:

FORMULA E

Finishing Coat

(*DARK GREEN*)

*100 pounds Dutch Boy red-lead.
10½ gallons pure linseed oil.
15 pounds paste medium chrome yellow.
52 pounds paste prussian blue.

FORMULA F

Finishing Coat

(*BLACK*)

*100 pounds Dutch Boy red-lead.
15 gallons pure linseed oil.
1 gallon pure turpentine.
52 pounds paste lampblack.
16 pounds paste prussian blue.

FORMULA G

Finishing Coat

(*LIGHT GRAY*)

100 pounds Dutch Boy white-lead.
4 ounces paste lampblack.
8 ounces paste french ochre.
4 gallons pure raw linseed oil.
1 pint pure turpentine.
1 pint pure drier.

FORMULA H

Second Coat

(*LIGHT FINISH*)

100 pounds Dutch Boy white-lead.
1½ gallons pure raw linseed oil.
1½ gallons pure turpentine.
1 pint pure drier.

FORMULA J

Final Coat

(*LIGHT FINISH*)

100 pounds Dutch Boy white-lead.
3½ to 4 gallons pure raw linseed oil.
1 pint pure turpentine.
1 pint pure drier.

*See 14, page 4 of Notes.

Section C. The specification writer is not confined to the method of procedure suggested in Section C on the opposite page. He may wish to follow his own method of detailing the work and giving painting instructions. In this case it will be found that Section C contains all data and information necessary to cover this essential part of the specification.

Section C. All formulas recommended in Section C will be found in this specification as follows: A, B, C and D on page 5; E, F, G, H and J, page 6.

15. Generally speaking two coats on unprimed work and one coat on primed work are not as satisfactory as the practice recommended, but under special conditions the architect may consider them sufficient. If the practice of two coats on unprimed work is followed, the architect should specify formula A and one of our finishing coat formulas, omitting formula B. If primed work is to be painted with only one coat, the architect should specify one of our finishing coat formulas.

15.(b) For work which will be inaccessible after erection some eminent engineers have used a mixture of 60 pounds of Dutch Boy red-lead to a gallon of linseed oil, with necessary drier.

15.(d) Formula B is a red-lead coat, slightly tinted with lampblack. The difference in color between the first and second coats is desirable to assure complete covering and to facilitate inspection of the second coat. If the architect desires 2 or 3 coats of formula A, it may be used in place of formula B for the second coat and in place of one of the formulas given in the parentheses for the finishing coat.

16. See notes 15, 15(b) and 15(d) above.

16.(b) Formula H should be specified instead of formula B as the first coat, when the color desired for the finishing coat is not included in formulas C, D, E, F, or G (the finishing colors offered in the specifications from which to make a choice) and is too light to cover the light brown color of formula B. Formula J should be specified as the finishing coat over formula H; in the latter case the name and description of the color desired or a sample swatch should be included in the specifications.

16.(c) Formula H should be specified instead of formula B as the second coat, when the color desired for the finishing coat is not included in formulas C, D, E, F, or G (the finishing colors offered in the specification from which to make a choice) and is too light to cover the light brown color of formula B. Formula J should be specified as the finishing coat over formula H; in the latter case, the name and description of the color desired or a sample swatch should be included in the specifications.

SECTION C
Application of the Paint

(See first two notes at top of opposite page)

15. STRUCTURAL STEEL AND IRON WORK:

(a) *Before Erection:*

(Here list and describe surfaces to be painted.)

(b) All work, delivered without a priming coat, shall, after cleaning, be primed, using formula A, and all surfaces which will be inaccessible after erection, shall receive two coats of paint, using formula A for both coats.

(c) *After Erection:*

(Here list and describe surfaces to be painted.)

(d) All work, after priming, whether primed in the shop or on the job, shall receive two coats of paint, using formula B for the second coat and formula *(C,*dark brown;* D, *light green;* E, *dark green;* F, *black;* or G, *light gray*) for the finishing coat.

16. EXTERIOR EXPOSED METAL:

(a) (Here list and describe surfaces to be painted.)

(b) All work which is delivered primed shall, before erection, receive one additional coat on inaccessible parts, using formula A, and after erection shall receive two coats of paint using formula *(B; or H; see note 16b on opposite page) for the first coat, and for the finishing coat, formula *(C, *dark brown;* D, *light green;* E, *dark green;* F, *black;* G, *light gray;* or J, tinted to match color hereinafter specified.)

(c) All work which is delivered unprimed shall receive a priming coat, either before or after erection, using formula A, and after erection shall receive two additional coats, using formula *(B; or H; see note 16c on opposite page) for the second coat and for the finishing coat, formula *(C, *dark brown;* D, *light green;* E, *dark green;* F, *black;* G, *light gray;* or J, tinted to match color hereinafter specified.)

*Strike out formulas *not* desired, letting stand the one to be used.

17. See 15, 15(b), 15(d), 16(b) and 16(c), page 7 of Notes.

18. See 15, 15(b), 15(d), 16(b) and 16(c), page 7 of Notes.

17. INTERIOR EXPOSED METAL:

(a) (Here list and describe surfaces to be painted.)

(b) All work which is delivered primed shall receive two coats, using formula *(B; or H; see 16b, page 7 of Notes) for the first coat and for the finishing coat formula *(C, *dark brown;* D, *light green;* E, *dark green;* F, *black;* G, *light gray;* or J, tinted to match color hereinafter specified.)

(c) All work which is delivered unprimed shall receive three coats of paint, using formula A for the priming coat, formula *(B; or H; see 16c, page 7 of Notes) for the second coat and for the finishing coat formula *(C, *dark brown;* D, *light green;* E, *dark green;* F, *black;* G, *light gray;* or J, tinted to match color hereinafter specified.)

18. GALVANIZED IRON:

(a) (Here list and describe surfaces to be painted.)

(b) The surface of all work shall be thoroly cleaned with benzine to remove grease and shall be primed with formula A and receive two additional coats, using formula *(B; or H; see 16c page 7 of Notes) for the second coat and for the finishing coat formula *(C, *dark brown;* D, *light green;* E, *dark green;* F, *black;* G, *light gray;* or J, tinted to match color hereinafter specified.)

*Strike out formulas *not* desired, letting stand the one to be used.

SUPPLEMENT

A.S.T.M. AND GOVERNMENT SPECIFICATIONS

On the following pages will be found specifications of the American Society for Testing Materials and of the United States Government, on the paint materials listed below:

AMERICAN SOCIETY FOR TESTING MATERIALS

STANDARD SPECIFICATIONS

FOR

RED-LEAD

*Serial Designation: D 83—24**

These specifications are issued under the fixed designation D 83; the final number indicates the year of original adoption as standard or, in the case of revision, the year of last revision.

Issued as Tentative, 1921; adopted in Amended Form, 1924.

1. These specifications cover red-lead to be used as a pigment, purchased in the form of dry pigment or ground in oil to form a paste.

I. Manufacture

2. (a) *Dry Pigment*—The pigment shall be made by roasting litharge or lead, or compounds of lead which yield litharge by heating.

(b) *Paste.*—The paste shall be made by thorolygrinding the specified pigment in pure raw or refined linseed oil.

Note.—Avoid storing red-lead paste in places of high temperature as heat accelerates the tendency of this material to cake or harden.

Purchasers are cautioned not to buy red-lead in paste form unless it is to be used within three months after shipment by the contractor.

II. Properties and Tests

3. (a) *Dry Pigment.*—The pigment shall consist entirely of oxides of lead, free from all adulterants and shall conform to the following requirements:

	85 Per-Cent Grade	*95 Per-Cent Grade*
True red-lead, Pb_3O_4, minimum, per cent	85.0	95.0
Total impurities, including moisture, soluble matter, water and matter insoluble in a mixture of nitric acid and hydrogen peroxide, maximum, per cent	1.0	1.0
The remainder shall be lead monoxide (PbO) coarse particles retained on a Standard No. 325 screen†, maximum, per cent.	2.0	1.0

*Subject to any revision if and when made.

†See Footnote on page 11.

When mixed with raw linseed oil, turpentine and liquid drier, in the proportions:

Dry red-lead	20 lbs.
Raw linseed oil	5 pts.
Turpentine	2 gills
Liquid drier	2 "

the resulting paint, when brushed on a smooth vertical iron surface, shall dry hard and elastic, without running, streaking or sagging.

(b) *Paste.*—The paste as shipped by the contractor, and for three months thereafter, shall not be caked in the container and shall readily break up in oil to form a smooth paint of brushing consistency. The paste shall have the following composition:

	Maximum	*Minimum*
Pigment, per cent	94.0	92.0
Linseed oil, per cent	8.0	6.0
Moisture and other volatile matter, per cent	0.5	....
Coarse particles and skins (total residue retained on a Standard No. 325 screen†, based on pigment), per cent	1.5	....

When mixed with raw linseed oil, turpentine and liquid drier in the following proportions:

Red-lead paste	20 lbs.
Raw linseed oil	4½ pts.
Turpentine	2 gills.
Liquid drier	2 "

the resulting paint, when brushed on a smooth vertical iron surface shall dry hard and elastic without running, streaking or sagging.

4. One sample shall be taken at random from each lot of 1000 packages or less. If the packages are of such size that 1000 packages amount to more than a carload, one sample shall be taken at random from each carload.

†For determining coarse particles, screens 3 in. in diameter are recommended. The screen cloth is described as follows: No. 325 cloth of the U. S. Standard Sieve Series should be made of wire 0.036 mm. (0.0014 in.) in diameter, a tolerance of 15 per cent under and 35 per cent over being allowed on this diameter. The average opening between adjacent parallel wires should be 0.044 mm. (0.0017 in.) the tolerance being 8 per cent with the additional limitation that the maximum opening shall not exceed 0.044 mm. by more than 90 per cent.

AMERICAN SOCIETY FOR TESTING MATERIALS

TENTATIVE SPECIFICATIONS

FOR

PURITY OF RAW LINSEED OIL FROM SOUTH AMERICAN SEED*

*Serial Designation: D 77—21 T***

This is a tentative Standard only, published for the purpose of eliciting criticism and suggestions. It is not a Standard of the Society and until its adoption as Standard it is subject to revision.

Issued, 1921

I. Properties and Tests

1. Properly clarified raw linseed oil from South American seed shall conform to the following requirements:

	Maximum	*Minimum*
Specific gravity at 15.5° C	0.9360	0.9310
Acid number	6.00	.....
Saponification number	195	189
Unsaponifiable matter, per cent	1.50	.....
Refractive index at 25° C	1.4805	1.4780
Iodine number (Hanus)	.....	170

II. Methods of Testing

2. The oil shall be tested in accordance with the methods recommended in Section 2 of the Standard Specifications for Purity of Raw Linseed Oil from North American Seed (Serial Designation: D 1) of the American Society for Testing Materials.†

*Criticisms of these Tentative Specifications are solicited and should be directed to Mr. R. L. Hallett, Secretary of Committee D-1 on Preservative Coatings for Structural Materials, 105 York Street, Brooklyn, N. Y.

**Subject to any revision if and when made.

†1921 Book of A. S. T. M. Standards (page 13 of this book).

AMERICAN SOCIETY FOR TESTING MATERIALS

STANDARD SPECIFICATIONS

FOR

PURITY OF RAW LINSEED OIL FROM NORTH AMERICAN SEED

*Serial Designation: D 1—15**

These specifications are issued under the fixed designation D 1; the final number indicates the year of original adoption as standard, or in the case of revision, the year of last revision.

Adopted, 1913; Revised, 1915

I. Properties and Tests

1. Raw linseed oil from North American Seed shall conform to the following requirements:

	Maximum	*Minimum*
Specific gravity at $\frac{15.5°}{15.5°}$ C	0.936	0.932
or		
Specific gravity at $\frac{25°}{25°}$ C	0.931	0.927
Acid number	6.00	.....
Saponification number	195	189
Unsaponifiable matter, per cent	1.50	.....
Refractive index at 25° C	1.4805	1.4790
Iodine number (Hanus)	.....	180

II. Method of Testing

2. The recommended methods of testing are as follows:

General.—All tests shall be made on oil which has been filtered at a temperature of between 60 and 80° F. thru paper in the laboratory immediately before weighing out. The sample should be thoroly agitated before the removal of a portion for filtration or analysis.

*Subject to any revision if and when made.

Specific Gravity.—Use a pyknometer, accurately standardized and having a capacity of at least 25 cc., or any other equally accurate method, making a test at 15.5° C., water being 1 at 15.5° C., or a test at 25° C., water being 1 at 25° C.

Acid Number.—Expressed in milligrams of KOH per gram of oil. Follow the method described in Bulletin No. 107, revised 1908, Department of Agriculture, Bureau of Chemistry, page 142.

Saponification Number.—Expressed as with Acid Number. Blanks should also be run to cover effect of alkali in glass. Follow method given in Bulletin No. 107, revised 1908, Department of Agriculture, Bureau of Chemistry, pages 137-138.

Unsaponifiable Matter.—Follow Boemer's method taken from his Ubbelohde Handbuch Der Ole u. Fette, pages 261-262. "To 100 g. of oil in a 1000 to 1500-cc. Erlenmeyer flask add 60 cc. of an aqueous solution of potassium hydroxide (200 g. KOH dissolved in water and made up to 300 cc.) and 140 cc. of 95 per cent alcohol. Connect with a reflux condenser and heat on the water bath, shaking at first until the liquid becomes clear. Then heat for one hour with occasional shaking. Transfer while yet warm to a 2000-cc. separatory funnel to which some water has been added, wash out the Erlenmeyer with water using in all 600 cc. Cool, add 800 cc. of ether and shake vigorously one minute. In a few minutes the ether solution separates perfectly clear. Draw off the soap and filter the ether (to remove last traces of soap) into a large Erlenmeyer and distill off the ether, adding if necessary one or two pieces of pumice stone. Shake the soap solution three times with 400 cc. of ether, which add to the first ether extract. To the residue left after distilling the ether add 3 cc. of the above KOH solution, and 7 cc. of the 95 per cent alcohol, and heat under reflux condenser for ten minutes on the water bath, transfer to a small separatory funnel, using 20 to 30 cc. of water, and after cooling shake out with two portions of 100 cc. of ether; wash the ether three times with 10 cc. of water. After drawing off the last of the water, filter the ethereal solution so as to remove the last drops of water, distill off the ether dry residue in water oven and weigh."

Or any accurate method involving the extraction of the dried soap may be used.

Refractive Index.—Use a properly standardized Abbe Refractometer at 25° C., or any other equally accurate instrument.

Iodine Number (Hanus).—Follow the Hanus method as described in Bulletin No. 107, revised 1908, Department of Agriculture, Bureau of Chemistry, page 136.

AMERICAN SOCIETY FOR TESTING MATERIALS

STANDARD SPECIFICATIONS

FOR

TURPENTINE

*Serial Designation: D 13—24**

These specifications are issued under the fixed designation D 13; the final number indicates the year of original adoption as standard, or, in the case of revision, the year of last revision.

Adopted 1915; Resubmitted as Tentative, 1920; Adopted in Amended Form, 1924.

1. These specifications apply both to the turpentine that is distilled from the pine oleoresins, commonly known as "gum spirits" or "spirits of turpentine", and to turpentine commonly known as "wood turpentine", which is obtained from resinous wood, whether by steam or by destructive distillation. When ordering under these specifications, the purchaser shall specify whether (a) gum spirits or (b) wood turpentine is desired. When wood turpentine is specified, it may be stated whether steam or destructively distilled wood turpentine shall be furnished.

I. Properties and Tests

2. Turpentine shall be pure and conform to the following requirements:

3. The turpentine shall be clear and free from suspended matter and water.

4. The color shall be "Standard" or better.

5. The odor shall be characteristic of the variety of turpentine specified and, if desired, shall conform to the odor of the sample agreed upon.

6. Other properties shall be as follows:

	Maximum	*Minimum*
Specific gravity, 15.5°/15.5° C	0.875	0.862
Refractive index at 20° C.—		
Gum spirits	1.478	1.465
Wood turpentine	1.478	1.465
Residue after polymerization with 38 N H_2SO_4:		
Gum spirits—		
Volume, per cent	2.0	.....
Refractive index at 20° C	.....	1.500
Wood turpentine—		
Volume, per cent	2.5	.....
Refractive index at 20° C	.....	1.48
Initial boiling point at 760 mm. pressure	160° C	150° C
Distilling below 170° C at 760 mm. pressure, per cent	.....	90

*Subject to any revision if and when made.

II. Detection and Removal of Separated Water

7. Draw a portion by means of a glass or metal container with a removable stopper or top, or with a "thief," from the lowest part of the container, or by opening the bottom valve of the perfectly level tank car. If water is found to be present draw it all out, record the quantity, and deduct it from the total volume of liquid delivered.

UNITED STATES GOVERNMENT SPECIFICATION

FOR

LIQUID PAINT DRIER

FEDERAL SPECIFICATIONS BOARD

*Standard Specification No. 20**

This specification was officially adopted by the Federal Specifications Board on February 3, 1922, for the use of the departments and independent establishments of the Government in the purchase of materials covered by it.

I. General

This specification applies both to straight oil drier—that is, material free from resins or "gums"—and to Japan drier; that is, material containing varnish "gums."

The drier shall be composed of lead, manganese, or cobalt, or a mixture of any of these elements combined with a suitable fatty oil, with or without resins or "gums", and mineral spirits or turpentine, or a mixture of these solvents. It shall be free from sediment and suspended matter. The drier when flowed on metal and baked for 2 hours at 100° C (212° F.) shall leave an elastic film. The flash point shall be not lower than 30°C. (85° F.) when tested in a closed-cup tester. It shall mix with pure raw linseed oil in the proportion of 1 volume of drier to 19 volumes of oil without curdling, and the resulting mixture when flowed on glass shall dry in not more than 18 hours. When mixed with pure raw linseed oil in the proportion of 1 volume of drier to 8 volumes of oil, the resulting mixture shall be no darker than a solution of 6 g of potassium dichromate in 100 cc. of pure sulphuric acid of specific gravity 1.84.

Note.—Deliveries will, in general, be sampled and tested by the following methods, but the purchaser reserves the right to use any additional available information to ascertain whether the material meets the specification.

*Subject to any revision if and when made.

II. Sampling

It is mutually agreed by buyer and seller that a single package out of each lot of not more than 1000 packages be taken as representative of the whole. Whenever possible, an original unopened container shall be sent to the laboratory, and when for any reason this is not done, the inspector shall thoroly mix the contents of the container sampled, transfer not less than one quart to a clean, dry glass bottle or tin can which must be nearly filled with the sample, securely stoppered with a new clean cork or well-fitting cover or cap, sealed, and distinctly labeled by the inspector. The inspector should take a duplicate from the container sampled to be held for check in case of dispute, and, when requested, should take a sample for the seller.

III. Laboratory Examination

(a) *Sediment and Suspended Matter.*—Thoroly mix the sample. Fill two test tubes of the same size (15 cm., or 6 inches) to within 2.5 cm. (1 inch) of the top with the sample. Stopper the tubes with clean corks. Let stand for 24 hours. Note whether sediment is evident in the tubes; if not, shake one tube vigorously and compare the two tubes. If they still look alike, the sample is considered free from sediment and suspended matter.

(b) *Color.*—Mix 2 cc. drier and 16 cc. clear pure raw linseed oil that complies with the specifications of B. S. Circular No. 82. Dissolve 6 g of pure powdered potassium dichromate in 100 cc. of pure concentrated sulphuric acid (specific gravity 1.84). Gentle heat may be used if necessary to secure a perfect solution of the dichromate. This solution should be freshly prepared. The color comparison shall be made by placing the 1.8 drier-linseed oil mixture and the dichromate-sulphuric acid solution in thin-walled glass tubes of the same diameter, 1.5 to 2 cm. (5/8 to 13/16 inch) to depths of at least 2.5 cm. (1 inch) and comparing the depth of color by looking thru the tubes across the column of liquid by transmitted light.

(c) *Mixing with Linseed Oil, Setting to Touch, and Drying.*—Mix 1 cc. of sample and 19 cc. of clear pure raw linseed oil that complies with the specifications of B. S. Circular No. 82. Thoroly clean a glass plate, finally washing with benzol and drying. Pour a portion of the mixture of linseed oil and drier over this plate and place the plate in a vertical position in a well-ventilated room, the atmosphere of which is free from products of combustion or laboratory fumes. Allow the remainder of the mixture to stand for 2 hours. No sediment or precipitate should appear. At 1-hour intervals examine the film of oil on the plate by touching it lightly with the finger at points not less than 2.5 cm. (1 inch) from the edges. If the film still has the greasy feel of fresh linseed oil, it has not set to touch. If the film feels tacky and adheres to the finger, it is considered to have set to touch. If the finger can be drawn lightly across the film without the oil sticking to the finger or the surface being marred by this treatment, the oil is considered dry. In case the test shows time of setting to touch or drying greater than 8 to 18 hours, respectively, a second test shall be run on a different day and the average of the two tests taken.

(d) *Nature of Baked Film.*—Thoroly clean with benzol a piece of bright sheet metal, either bright sheet iron, tin plate, or terneplate. Shake the sample of drier thoroly and flow enough on the plate so that a space at least 7.5 cm. (3 inches) wide is covered. Allow the plate to stand in a vertical position at room temperature for 30 minutes and then hang in an oven at a temperature of 100 to 105° C (212 to 221° F.) for 2 hours.

Remove the plate from the oven and allow it to stand at room temperature for not less than 1 hour. Test the film of drier with a knife blade at a point not less than 2.5 cm. (1 inch) from the edge. If the film powders or particles fly under the knife blade, it will be considered brittle, which will be cause for rejection.

(e) *Flash Point.*—Determine with either the "Tag" or Elliott closed-cup tester. The former is preferred.*

*Directions for using the Tag tester may be found in A. S. T. M. Standards D 56-21, and directions for using the Elliott cup in Proceedings A. S. T. M., 1917, pt. I, p. 414.

AMERICAN SOCIETY FOR TESTING MATERIALS

TENTATIVE SPECIFICATIONS

FOR

PURITY OF BOILED LINSEED OIL FROM SOUTH AMERICAN SEED*

*Serial Designation: D 78—21 T***

This is a Tentative Standard only, published for the purpose of eliciting criticism and suggestions. It is now a Standard of the Society and until its adoption as Standard it is subject to revision.

Issued, 1921

I. Properties and Tests

1. Boiled linseed oil from South American seed shall conform to the following requirements:

	Maximum	*Minimum*
Specific gravity at 15.5°/15.5° C	0.945	0.936
Acid number	8.00	.....
Saponification number	195	189
Unsaponifiable matter, per cent	1.50	.....
Refractive index at 25° C	1.4840	1.4780
Iodine number (Hanus)	.....	168
Ash, per cent	0.7	0.2
Manganese, per cent	.....	0.03
Calcium, per cent	0.3	.....
Lead, per cent	.....	.....

II. Methods of Testing

2. The oil shall be tested in accordance with the methods recommended in Section 2 of the Standard Specifications for Purity of Boiled Linseed Oil from North American Seed (Serial Designation: D 11)† of the American Society for Testing Materials†.

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*Criticisms of these Tentative Specifications are solicited and should be directed to Mr. R. L. Hallett, Secretary of Committee D-1 on Preservative Coatings for Structural Materials, 105 York Street, Brooklyn, N. Y.

**Subject to any revision if and when made.

†1921 Book of A. S. T. M. Standards (page 20 of this book).

AMERICAN SOCIETY FOR TESTING MATERIALS

STANDARD SPECIFICATIONS

FOR

PURITY OF BOILED LINSEED OIL FROM NORTH AMERICAN SEED

*Serial Designation: D 11—15**

These specifications are issued under the fixed designation D 11; the final number indicates the year of original adoption as standard, or in the case of revision, the year of last revision.

Adopted, 1915

I. Properties and Tests

1. Boiled linseed oil from North American seed shall conform to the following requirements:

	Maximum	*Minimum*
Specific gravity at $\frac{15.5°}{15.5°}$ C	0.945	0.937
Acid number	8	.....
Saponification number	195	189
Unsaponifiable matter per cent	1.5	.....
Refractive index at 25° C	1.484	1.479
Iodine number (Hanus)	.....	178
Ash, per cent	0.7	0.2
Manganese, per cent	.....	0.03
Calcium, per cent	0.3	.....
Lead, per cent	.....	0.1

II. Methods of Testing

2. The recommended methods of testing are as follows:

General.—The sample should be thoroly agitated before the removal of a portion for analysis.

Specific Gravity.—Use a pyknometer, accurately standardized and having a capacity of at least 25 cc., or any other equally accurate method, making a test at 15.5° C., water being 1 at 15.5° C.

*Subject to any revision if and when made.

Acid Number.—Expressed in milligrams of KOH per gram of oil. Follow the method described in Bulletin No. 107, revised 1908, Department of Agriculture, Bureau of Chemistry, page 142.

Saponification Number.—Expressed as with Acid Number. Blanks should also be run to cover effect of alkali in glass. Follow method given in Bulletin No. 107, revised 1908, Department of Agriculture, Bureau of Chemistry, pages 137-138.

Unsaponifiable Matter.—Follow Boemer's method taken from his Ubbelohde Handbuch Der Ole u. Fette, pages 261-262. "To 100 g. of oil in a 1000 to 1500 cc. Erlenmeyer flask add 60 cc. of an aqueous solution of potassium hydroxide (200 g. KOH dissolved in water and made up to 300 cc.) and 140 cc. of 95 per cent alcohol. Connect with a reflux condenser and heat on the water bath, shaking at first until the liquid becomes clear. Then heat for one hour with occasional shaking. Transfer while yet warm to a 2000 cc. separatory funnel to which some water has been added, wash out the Erlenmeyer with water using in all 600 cc. Cool, add 800 cc. of ether and shake vigorously one minute. In a few minutes the ether solution separates perfectly clear. Draw off the soap and filter the ether (to remove last traces of soap) into a large Erlenmeyer and distill off the ether, adding if necessary one or two pieces of pumice stone. Shake the soap solution three times with 400 cc. of ether, which add to the first ether extract. To the residue left after distilling the ether add 3 cc. of the above KOH solution, and 7 cc. of the 95 per cent alcohol, and heat under reflux condenser for ten minutes on the water bath. Transfer to a small separatory funnel, using 20 to 30 cc. of water, and after cooling shake out with two portions of 100 cc. of ether; wash the ether three times with 10 cc. of water. After drawing off the last of the water, filter the ethereal solution so as to remove the last drops of water, distill off the ether, dry residue in water oven and weigh."

Or, any accurate method involving the extraction of the dried soap may be used.

Refractive Index.—Use a properly standardized Abbe Refractometer at 25° C., or any other equally accurate instrument.

Iodine Number (Hanus).—Follow the Hanus method as described in Bulletin No. 107, revised 1908, Department of Agriculture, Bureau of Chemistry, page 136.

Ash.—The determination of the percentage of ash and the constituents thereof may be made by any method which gives accurate results.